GENERAL SERVICES ADMINISTRATION
WASHINGTON, DC 20405

PBS P 3440.7
July 14, 1983

GSA ORDER

SUBJECT: Estimating construction modifications

1. Purpose. This order issues and transmits a new HB, Estimating Construction Modifications.

2. Background. This HB establishes the requirements and expected products when estimating the cost of construction modifications. It also provides procedures for the technical analysis of cost proposals received from construction contractors. The productivity data in ch. 3 and the app. examples were contributed by the U.S. Army Corps of Engineers.

3. Applicability. The provisions of this HB are applicable to all personnel having construction cost estimating and construction contract administration responsibilities.

4. Forms. This order provides for the use of GSA Form 3320, Estimate Worksheet and GSA Form 3488, Technical Analysis Worksheet. An initial distribution of these forms will be made to all regional offices. Additional supplies should be obtained in the usual manner.

RICHARD O. HAASE
Commissioner
Public Buildings Service

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CHAPTER 1. INTRODUCTION

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1. Scope. This handbook provides information procedures and guidance for the estimating and processing of construction contract modifications. The contract modifications include change orders, contractor claims, the formal resolution of constructive changes, ripple effect (impact on unchanged work), suspension of work and time extension. This handbook will facilitate the settlement of price-to-be-determined later (PDL) contract modifications before the work is accomplished.

2. Definition. The term "estimator" as used in this HB refers to the Government employee who prepares or is responsible for putting together or coordinating the Government estimate of a proposed construction modification.

3. References. Estimators should be thoroughly familiar with:

a. Federal Procurement Regulations (FPR 1-3.8).

b. General Services Procurement Regulations (GSPR 5-26).

c. Procurement and Administration of Design and Construction (PADAC), Volume 2 (PBS P 3420.2).

d. Public Building Service Guide Specifications PBS (PCD): 01170.

e. Project Estimating Requirements (PBS P 3440.5).

f. Estimate Worksheet (PBS 3440.4).

4. Estimating standards. The following standards and penalties apply to all estimators and employees involved in the estimating process.

a. Performance. Each estimate and its associated work must meet the following standards:

(1) The estimate shall reflect all of the elements and deliverables set forth in the written scope of modification to be sent to the contractor for quotation.

(2) The estimate shall be independently prepared and delivered to the Contracting Officer in advance of receipt of the contractor's proposal.

(3) The estimate shall be mathematically accurate and sufficiently detailed to show all items of work by different trades separately, and to show additions and deletions of items of work separately.

(4) The estimate (figures and worksheets) shall remain confidential between the estimator and the Contracting Officer until receipt of the contractor's proposal. The contractor should not be given this information at any time, except to the extent needed for negotiating an item.

b. Administrative penalties. The GSA Administrative Manual, ch. 3-112 (OAD P 5410.1) provides for penalties for GSA estimators and other employees relating to:

(1) Willful preparation of an inaccurate Government estimate resulting in the acceptance of a given contractor proposal, thereby causing damage or financial loss to the Government.

(2) Negligent preparation of an inaccurate Government estimate with the same result as above.

(3) Negligent acceptance of incomplete services or payment for work not performed or not received. Care must be taken during negotiation of price not to relax scope requirements for the modification without a commensurate reduction in price or to permit undocumented "tradeoffs" of added and deleted work.

5. General background. Because each contract modification presents a unique set of circumstances, this HB will not deal specifically with all possible combinations. Therefore, the following material describes basic procedures which may be applied to estimating any modification. Personnel having detailed knowledge of the specific modification being evaluated should adapt these procedures and their underlying principles to each situation.

6. Settlement. It is GSA policy to settle the terms of a contract modification before the changed work is started. This requires timely action by both GSA and the contractor, culminating in an agreement on the fair and reasonable price, time and technical requirements for accomplishing the changed work. Occasionally it will be in the best interests of the Government to order the contractor to proceed with the performance of the work contemplated before the final price of the change is determined. These cases, however, are the exception rather than the rule and can only be ordered by the Contracting Officer personally.

7. Alternatives to agreement. If an agreement cannot be reached, GSA can use the following alternatives: Alternative 1, order the contractor to proceed with the performance of the work contemplated (not to exceed a specified obligated amount which would be a fair and reasonable cost of performing the directive work) with the equitable adjustment to be determined at a later date or alternative 2, issue a unilateral modification. Using alternative 1 may render the progress schedule ineffective as a management tool and useless for determining the extent of ripple effect for future modifications. In effect, alternative 1 provides the contractor a cost-plus contractual relationship on the modification work. Alternative 2 establishes (at least tentatively) the modification cost and time factors, and allows prompt revision of the progress schedule, thus maintaining its usefulness. The use of alternative 2 requires a high degree of confidence in the Government estimate. Neither of the alternatives can adequately replace the achievement of an agreement for an equitable adjustment before the changed work is started.

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Figure 2-4. Sample estimate

CHAPTER 2. ESTIMATING REQUIREMENTS

1. Content. This chapter establishes policies and procedures for the estimating and/or review of all estimates prepared for construction contract modifications.

2. Procedures. These policies and procedures shall be used in the preparation and/or review of estimates of construction changes, establishment of costs for time extension, claims and suspensions-of-work hereafter known as contract modifications.

a. After the award of a construction contract, modifications may be required to correct design omissions, defects, interferences, underground conditions at variance with the contract documents, changes due to changed occupancy requirements, and other causes.

b. Detailed and accurate cost estimates shall be developed from the revised contract documents which define the modifications.

c. Estimates shall be prepared by professional full-time GSA regional estimators with the following exception:

(1) Changes estimated to be within the resident engineer's delegated authority less than $10,000 may be prepared by the resident engineer as designated by the Contracting Officer on a project by project basis.

(2) Estimates may be prepared by contract A-E's involved with revisions to the contract documents or by independent cost consultants who are given the opportunity to become familiar with construction conditions.

d. The basis guide for estimating the cost of contract modifications is Clause 3, Changes of Standard Form 23A, General Provisions (Constructions Contract), and the supplement thereto described in Clause 23, Equitable Adjustments, of GSA Form 1139, General Conditions.

3. General estimating guidance.

a. Clause 3 of the General Provisions gives the Government a unilateral right to require modifications in the work required by the contract, as long as the modifications are within the general scope of the contract. It may entitle the contractor to an "equitable adjustment" of the contract price and/ or time for completion, reflecting the increased or decreased costs of performing as a consequence of the modification as well as any change in the time required for completing the work caused by the modifications.

b. When issuance of the modification has been made necessary because the contract specifications have been defective, the equitable adjustment must include costs (to the extent they are reasonable) incurred by the contractor in attempting to comply with the defective specifications up to the time the modification was issued.

c. Additional costs and time resulting from ripple effect shall be included in the estimate.

d. A "constructive change" is an interpretation, instruction, directive or determination issued to the contractor by an authorized Government representative, which the contractor assorts feels has the effect of changing the requirements specified in the contract. If true, the contractor is entitled to recover only those costs incurred within 20 days before the date the Contractor notified the Contracting Officer in writing of the firms interest to seek compensation for the interpretation, instruction, directive, or determination.

e. When the contractor identifies defective, incomplete or omitted data or specifications in the contract documents, he may request a contract modification to make the necessary corrections. A proposed correction and a cost proposal may be initiated by and submitted by the contractor.

4. Independent estimate. An independent Government estimate is required for proper evaluation and negotiation of the cost and time effect of contract modification, (FPR 1-18.108). An independent estimate is required for the following situations:

a. Before-the-fact estimate.

(1) The independent estimate for contract modifications requested by the Government shall be prepared prior to the proposal request being sent to the contractor. The Government estimate shall be prepared on GSA Form 3320. (See fig. 2-4.) The Government estimator shall be provided the same documents concerning the proposed modification that the contractor will be provided or have access to it. This data will require the estimator to closely examine the work to be done and should result in an estimate that will closely compare with the contractor's estimated scope of the modification.

(2) The Design and Construction (D&C) field representatives, if so authorized, may estimate individual prospective contract modifications within their delegated authority. If the individual modification (1) involves either an add or deduct in excess of the delegated authority, or (2) includes both increases and decreases where the arithmetic sum of the add and deduct items exceeds the delegated authority, the Government estimate shall be prepared by the regional estimating staff or prepared by the A-E and reviewed by the regional estimating staff.

b. After receipt of contractor proposal.

(1) The independent Government estimate prepared in response to a contractor-initiated proposal shall be prepared in the same level of detail as the contractor's proposal. This estimate must be prepared by the regional Design and Construction estimator using GSA Form 3320. (See Fig. 2-4.)

(2) The regional D&C estimator is to be provided a copy of the scope of the modification and a copy of the contractor's proposal with the costs deleted.

5. Estimator preparation. The estimator needs more than just the scope or description of the changes to be made in order to establish a position on an equitable price. Data on the status of the project and the context into which the modification will be made is critical to an accurate estimate, particularly if there are ripple effects to be considered.

a. Access to data. The estimator must have access to all existing contract data. Some examples are:

(1) CPM or construction schedule.
(2) Inspection reports.
(3) Payments made to date.
(4) Contract modification documents.
(5) Wage scales.

b. Site investigation. When the size and complexity of thy modification justifies it, a visit should be made by the estimator to the site to get first hand information, such as:

(1) Stage of construction.
(2) Equipment on the site.
(3) Any unique conditions.
(4) Status of delivered materials.
(5) Status of orders placed with suppliers.

c. Telephone investigation. Arrangements should be made through the Contracting Officer to call the contractor whenever necessary for information needed for a complete and accurate independent estimate such as suppliers used, construction status, and procurement status. During these contractor calls, the estimator shall at all times be vigilant so that no actual or implied commitments are made about any part of the contract; nor should final cost be discussed.

6. Estimating procedures. GSA Form 3320 (see fig. 2-4) shall be used to estimate all changed work. The following items are to be included if applicable in each estimate as stated below:

a. Material. Estimators are to use the conventional product or system unit of measure and quantities. List material credits separate from any extras, do not mix these quantities. Show list prices separately from any applicable discounts. Exact material quantities needed for the work are to be separated from the allowances for waste, scrap or breakage. The manufacturing burden associated with material fabrication performed off the job site will be considered to be part of the material costs of the fabricated item delivered to the job site.

b. Labor. Estimate all labor by crew manhours showing crew composition and applicable contract wage scales including fringe benefits. Crew hours are to be identified with specific item of material placed or operation performed. Pricing shall be based on the average crew rate per hour. For example, the crew rate to install the 774 SF of 6 inch CMU partition shown in fig. 2-4 was calculated as follows:

Crew	Hourly Rate	Daily Pay
3 bricklayers	17.60	$422.40
2 helpers	13.90	222.40
.25 carpenter	17.00	34.00
42 MH per day		$678.80

Crew rate = $16.16 per hour
Crew production rate = 420 SF per day
774 SF = 1.84 crew days

1.84 crew days=

77.4 crew hours

c. Equipment. Cost of construction equipment needed exclusively for the contract modification is to be clearly identified including cost of moving, setup and tear down. Also estimate the net credit for any equipment that was previously required, but will not now be needed. Determine whether the equipment is owned or rented to prevent duplication of costs in overhead or depreciation. Establish whether fuel and operator costs are included in equipment hours or is a separate cost.

d. Overhead. Overhead is the cost incurred for the general operation of the contract that cannot be directly identified as resulting from a specific activity. Included, but not entirely limited to, are job site staff and office expenses, incidental job burdens and small tools. Overhead may also be referred to as burden or indirect costs.

(1) If an audited overhead rate has been established for the contract, examine it carefully to make sure that these items are not duplicated in the direct cost estimate. Use the audited overhead rate on each contract modification if less than the 10 percent maximum in the Equitable Adjustments Clause of the contract.

(2) In the absence of an audited rate, the estimator shall evaluate the contractor's potential overhead expense in administering the work. Overhead is a negotiable factor with an upper limit of 10 percent. The rate or rates used by the estimator for each modification shall represent the estimator's judgment regarding the contractor's cost to administer the work after approval.

e. Bonds. Bonding cost should be included as part of the Government estimate if, in fact, the modification requires additional bonding, and the contractor delivers to the Government new bonds. Under such circumstances the contract modification shall specify that additional bonding in a designated amount shall be provided to the Government.

f. Profit. Profit and/or commission is a negotiable factor, also limited to 10 percent by the Equitable Adjustment Clause of the contract. Profit is allowed on all work to be performed by a prime contractor or any subcontractor. Commission, however, is allowed only to prime contractors on work performed by first tier subcontractors. Based on the circumstances of the procurement action, each of the below factors shall be weighted from .00 to .10. The value shall be obtained by multiplying the rate by the weight. The value column, when totaled, indicates the fair and reasonable profit percentage under the circumstances of the particular procurement.

Weighted Guidelines

Factor	Rate	Weight	Value
Degree of cost risk		25	
Relative difficulty of work		20	
Size of modification		15	
Period of performance		20	
Contractor's investment		5	
Subcontractor coordination		15	____
100 %			

g. Application of markups. Equitable adjustments for deleted work shall include credits for overhead, profit and commission. On proposals covering both increases and decreases in the amount of the contract, the application of overhead and profit shall be applied on the net change in direct costs for the contractor or subcontractor performing the work.

7. Estimating for time extensions. If a time extension is indicated in the modification, or claimed by the contractor, the estimator shall estimate its cost to the contract in terms of dollars and time. If the modification omits this issue, the estimator shall make a written judgment as to the need for a time extension and its cost to the contract, and shall include it as an identifiable item in the estimate.

8. Estimating for ripple effect. Most contractors prefer to leave the settlement of ripple effect until after the modification work is performed and negotiate on the basis of actual costs incurred, thus transferring all risk to the Government. This procedure is not allowed. The required approach is to anticipate the costs before the fact, and to include them in the cost estimate and price out the work with the contractor as soon as possible.

a. A current construction schedule or CPM is necessary to identify likely areas of ripple effects and who will be affected. A careful review of the design and schedule is to be made to visualize and ascertain the scope of potential ripple effects.

b. The cost impact of these ripple effects shall be separately identified and estimated as part of the modification. (See ch. 3 for a thorough discussion of ripple effect.)

9. Validity of estimate. The estimate shall be prepared on the assumption that the modification will be promptly ordered. Estimates of modification costs are extremely time sensitive as job, site, and contract conditions are continually changing. Therefore, all estimates shall be dated when delivered to the Contracting Officer and they shall have a "valid to" date. The "valid to" date will be determined by the estimator based on the job condition assumptions used as a basis for estimating. Work ordered after the "valid to" date is subject to re-estimating.

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PART 1. TIME

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1. Scope. This chapter provides a comprehensive review of the elements of ripple effect, the most elusive cost factor in determining the value of a construction modification. No set procedure can be established to evaluate ripple effect, as each modification occurs under different circumstances. The estimator should study the issues pointed out in this chapter and use the tools listed below.

2. Early warning. The first clue to a probable ripple effect is to notice or suspect potential delays. When there is to be ripple effect from a modification, a time delay will be involved. However, this does not always mean a time extension is warranted. For example:

a. Does the modification cause the delay or would the project be delayed anyway?

b. Does the delay run concurrently with other delays, i.e., for work stoppage, weather, slack time and unavailable labor?

3. Job status.

a. Knowing the current status of a job is important when making an estimate for the changed work portion of a contract modification, and absolutely vital to estimating ripple effect. Data on current job status should be developed without influence from the contractor's own progress schedule. In many cases, the contractor's real plan for pursuing the work is not the same as indicated on the schedule. The schedule may not have been revised to reflect the effects of previous modifications, or both. In analyzing the current status of a job, accurate data must be compiled on the following:

(1) Activities completed.

(2) Activities in progress (including percent complete).

(3) Activities to start soon (not necessarily from progress schedule).

(4) Onsite manpower (divided into supervisory, administrative, contractor's inspection team and various

crafts; the employer, contractor, subcontractor, and numbers and types employed on each activity in progress must be indicated).

(5) The formal progress reports on GSA Form 184, GSA Form 220 or the resident engineer's daily diary, GSA Form 1524; and all related letters, memoranda, or special reports must be reviewed to determine production efficiency-and past delaying factors.

(6) Materials onsite (for future incorporation into the facility); materials submitted, approved, and ordered (including anticipated delivery date).

(7) Materials submitted, approved, but not ordered.

(8) Materials submitted, disapproved, and not resubmitted.

(9) Materials not submitted, where approval and procurement lead time is such that they may not be delivered to the site in time to avoid delaying a part of the work.

(10) Construction equipment and special tools; the status (i.e., working or not working) must be indicated. If working, activities for which used must be shown; if not working, whether or not future need exists (indicate specific activity) must be shown.

b. Current job status information must be developed early in the estimating process for a modification. However, since the status of a job changes from day to day, the information must be updated to reflect any significant change right up to the date negotiations are conducted.

4. Progress schedule.

a. The General Conditions (GC) (GSA Form 1139) clause titled, "Construction Progress Chart", establishes the basis for requiring the contractor to submit his progress schedule for approval. The Contract Special Conditions (Section 01000) will include a clause, supplementing the GC, to indicate the type of schedule required. GSA construction contracts will use either a Network Analysis System (NAS), as defined in PBS P 3420.2 (PADAC 2), Subpart 54.3 and PBS Guide Specification (PCD) 01170; or a Bar Chart, per PADAC 2, Subpart 54.101. For the identification of ripple effect, the NAS, more commonly known as the CPM (Critical Path Method), is more detailed than the Bar Chart. To develop such detail from a Bar Chart may require breaking the relatively large units of work shown on the chart into networks of individual activities with corresponding duration and dollar value. Normally, the Bar Chart schedule is specified for only small, routine projects where the presence or absence of ripple effect may be more evident. This handbook assumes that the project specifies NAS scheduling; or, if not, that the Government personnel familiar with the work in the contract will have developed from the Bar Chart, a detailed network required to identify activities susceptible to ripple effect.

b. When GSA approved the contractor's progress schedule, GSA accepted the information it conveyed as defining a practicable way to accomplish the work within the contract completion time. As long as actual progress meets or exceeds that schedule, the originally approved progress schedule remains valid. Very few, if any, construction projects are completed according to the original schedule. Something usually happens along the way that makes the subsequent portion of the original plan undesirable to the contractor, or just plain unworkable. The causes for this arise from three areas:

(1) The Contractor. The contractor fails to diligently pursue the work, plans poorly, or the prime

contractor, subcontractor, or suppliers fail to perform the work in the sequence scheduled.

(2) The Government. GSA changes the work, gives inaccurate site conditions data, fails to take timely actions, etc.

(3) Other delays. Delays caused by events defined in the contract as "excusable" delays.

c. If the progress schedule is to be a valid tool for identifying and evaluating ripple effect, it must reflect all changes to the original schedule regardless of the reasons for them. The most frequent cause for revising the progress schedule is to accommodate contract modifications initiated by the Government. It is important to settle each modification as it is identified and immediately make appropriate revisions to the progress schedule.

5. Procedures. To estimate the time impact of a proposed modification and judge its ripple effect on other work, it is necessary to develop a schedule for the changed work. Although the Government cannot prescribe a construction method to the Contractor, the Government estimator can document the basis of a workable solution used to prepare the Government's position on cost and time. To develop a schedule for the changed work, the following steps should be taken in conjunction with the resident engineer:

a. Update the NAS. The data on job status show which activities remain to be accomplished, and whether the necessary materials can be expected onsite to support these activities as scheduled. Except for Government Furnished Equipment (GFE), the contractor is responsible for obtaining all materials in a timely manner. If some materials will not be available when needed to maintain scheduled progress, the schedule should be marked up to reflect this situation.

(1) Determine what activities will be changed. Analyze the scope of the modification to determine which remaining activity(ies) will be directly affected; that is, identify the activity(ies) having less work, more work, or other revisions. Judge who will be delayed and what will be delayed.

(2) Determine revised duration for the changed activities. Using the estimate of direct changes, assign to the affected activity(ies) revised durations, reflecting the sum of the duration assigned by the contractor and the duration now estimated as required to accommodate the modification.

(3) Develop new activity(ies) if necessary. When part or all of the work to be performed under a modification does not fit an existing activity, the estimator should create a new activity tied into existing nodes.

(4) Determine where new activities best fit into the network. Many factors must be considered when selecting the start and finish nodes for the activities: (a) other activities which restrain its start, (b) material procurement lead time (this could be a new activity itself), (c) weather (if the work is outdoors), (d) duration of changed work, and (e) other activities restrained by the new activities. The challenge is to find where the addition of changed work will least disrupt the remaining work. Since ripple effect costs affect only activities that are not directly changed by the modification, the fewer unchanged activities remaining when the modification work starts, the less potential there is for cost due to ripple effect.

(5) Identify the effect on the unchanged work of the new activities. Completion of at least some of the unchanged work will probably depend on completion of the modification work. The estimator must accept this limitation, insert the modification work into the network, and start to identify unchanged activities that represent potential points of ripple effect.

b. The revised progress schedule now shows the remaining work and the changes introduced by the modification. Using the duration previously assigned, and taking advantage of any float time, new early start (ES), early finish (EF), late start (LS), and late finish (LF) dates are calculated. These calculations show the schedule for completing the modification work and the other remaining work. The critical path may have changed, and it is likely that the earliest completion date has also changed.

c. If the modification work affects only activities not on the critical path, with enough float to absorb the modified work, the completion date will not change. Total float is the amount of time any given activity or path of activities may be delayed before it will affect the project completion time (PCD) 01170, (paragraph 8.3). In this case, all of the remaining activities, including those directly affected by the modification, have stayed within their contract time frame; consequently, the modification does not justify additional completion time. This result is more likely for a modification issued early in the job, before float time is depleted.

d. If rescheduling the remaining work to include the modification, as described above, has changed the final completion date, a time extension is justified. The difference between the previously scheduled final completion date and the newly developed completion date represents only the time extension caused by direct changes to the work. Now the scheduling changes that have occurred to the unchanged activities must be analyzed. So far, originally assigned durations have been retained,which by impact,may require assigning longer durations to at least some of the activities.

e. The revised schedule must now be analyzed to see how the modification has affected unchanged work activities. The answer to questions such as the following will help the analysis:

(1) Has any contractor scheduled activity been moved into a season where normal weather is more unfavorable or makes it impractical to do this type of work?

(2) Are there more activities in progress at a given time than indicated by the schedule before revision?

(3) Have any activities slipped to the extent that significant phases of the work, such as on closing a building, providing necessary utilities, completing an access road, building a coffer dam, etc., will not be accomplished before some overriding factor (winter, high water stages, unavailability of site) prevent it, thus making it necessary to delay part of the work until the next favorable season?

f. The durations of the ripple effect activities should be increased to reflect realistically the time required for their accomplishment. The schedule should also be revised to show any activities which require a dormant period. Dormant periods shall be defined in the final modification documents. The schedule should be updated to show the logical sequence and timing of activities representing both changed and unchanged work. Further slippage from the final completion date developed in paragraph d above, justifies an extension of contract completion time because of ripple effect. The total amount of the time extension for a modification is the sum of delays from direct changes and from ripple effect activities.

6. Conclusions. The above effort develops a logical schedule for the remaining work changed by the modification and all other work remaining at the time the modification is effective. The revised schedule represents a realistic sequencing and timing of the remaining work; however, it is only a working tool for the estimator's use, with no other contractual implications. It represents one method for completing the remaining work. It has quantified the time considered reasonable, without acceleration, for the contractor to accomplish the work.

a. The revised time schedule assumes that the contractor will proceed with the unchanged work using the same number of work days per week; the same number of shifts; and the same manpower density as planned before the modification. This approach will minimize, but not eliminate, ripple effect costs; however, its application is limited to those situations where the resulting completion date slippage is acceptable. Nevertheless, even when GSA or the Using Agency has indicated that a given completion date is mandatory, it is beneficial to first estimate the modification costs based on this approach, followed by an estimate of the modification costs required to meet the mandatory date. A comparison of the two amounts will enable the Government to reevaluate its position before becoming committed to a course of action that might be economically unjustifiable. The purchase of time by modification is very expensive and should be done only when justified. If the Government indicates that there is a rigid time requirement, the contractor may wait for his price terms to be met.

b. When the schedule is incompatible with a final completion date, the schedule should be compressed into the time available by reducing, as required, the duration of activities. This requires that the rate of progress be increased on some, perhaps most, activities. In other words, acceleration becomes a ripple effect when it enters the picture.

c. The principle of diminishing returns adversely alters the normal labor cost/productivity ratio. Situations may occur where the ripple effect cost is more than the cost of accomplishing the changed work. It is likely that the credibility of an estimate indicating such results will be questioned by those unfamiliar with the facts;it is therefore important for the estimator's work to be thoroughly documented.

d. An affirmative answer is required on all four of the following questions before an item can be included in the cost estimate when developing a ripple effect cost estimate.

(1) Has the contractor incurred or will actually incur an increase in costs?

(2) Is the modification the sole cause of the increase?

(3) Have all feasible actions been taken to reduce or eliminate this cost?

(4) Has it been established that the item does not duplicate any other compensable item included in the estimate for this modification?

e. The above questions are also applicable in the determination of the direct cost.

PART 2. COST FACTORS

7. Overhead.

a. Overhead for ripple effect is an additional cost, differing from overhead allowed on direct costs for the work outlined in the modification. Everyone not involved in the modification, shown to be delayed, could be entitled to additional overhead if the elements of cost that make up the overhead rate are expended over a longer period than anticipated.

b. The maximum exposure could be calculated by estimating the total overhead in a given subcontractors original price, dividing it by his contract period to determine a daily charge, and then multiplying the daily rate by the number of days of ripple effect.

8. Materials.

a. Ripple effect on construction materials can take several forms. The more common of these are:

(1) Partially completed construction costs of:

(a) Additional temporary protection,

(b) Rehandling, and

(c) increased scrap or damaged material.

(2) Materials stored offsite (cost of additional storage time).

(3) Materials shipments where it is better to have vendors defer shipments after the originally scheduled date may be charged by the vendor, and/or freight rates; and may increase the contractor's cost of obtaining the material.

b. These situations are not all-inclusive. It is not possible to list every way that a modification could increase the material-related aspects of the contractor's work.

9. Equipment.

a. Costs for equipment are similar to those for materials because both are relatively easy to quantify once their applicability is determined. Equipment in this context encompasses all the tools, large and small, assembled by the contractor in support of construction effort. Typical of modification ripple effects on equipment are:

(1) Temporarily taken out of service or standby time.

(2) Rescheduling work causing workspace limitations yields reduced productivity.

(3) Disruption of continuity; increased travel; decrease of production time.

(4) Additional mobilization and demobilization costs.

b. Only affected equipment is considered in determining the Government's liabilities for costs related to equipment. For example, if the contractor has 10 scrapers on the site, but five are down for repairs or deadlined awaiting removal, only the operational five are included in the cost estimate.

c. The costs of standby time can be developed in a relatively straight-forward manner from applicable equipment rate schedules such as the Contractor's Equipment Ownership Expense Schedule, published by the Associated General Contractors of America or other comparable, recognized standard.

d. Reduction in productivity caused by equipment crowding or increased travel time requires a study of the individual situation. The objective of such a study is to define the production time lost to traveling (hours) and the loss of productivity caused by crowding (converted to hours), plus equivalent additional costs for operators and oilers (when applicable).

e. In cases where one or more pieces of major equipment will be removed from service for a long period due to the modification, it is advisable to compare the cost of standby time for the entire period vs. the cost of demobilization and remobilization; whichever amount is smallest should be used in the estimate.

f. Mobilization is defined as the gathering of materials and equipment necessary to accomplish some phase of the construction operation. Demobilization is defined as the equipment removal and cleanup operation following completion of some phase of the work. Since mobilization and demobilization cycles occur frequently on a project, the time and costs required to mobilize and demobilize should be included in the estimate for a modification only when that modification caused the additional cycle.

10. Manpower. The two major ripple effects upon manpower are reduced productivity and pay scale increases. The latter is a factor when modifications delay work that would have been completed but must now be done when wages are higher. Reduced productivity takes many forms, and is therefore more difficult to measure.

a. Reduced labor productivity implies a loss from established normal or anticipated level of productivity. Although construction does not lend itself to definitive measurement of labor productivity, there are methods a contractor can use to measure anticipated labor costs when preparing a bid. The most common technique draws heavily on data derived from the contractor's past experience, including any indicated trends, present labor pay rates, and anticipated labor rate increases during the project.

b. The contractor's Network Analysis System (NAS) progress schedule carries lump sum values for each construction activity. However, the ratio of labor costs to material and equipment costs varies widely for different activities, so it is impractical to apply a universal rule-of-thumb ratio. Nevertheless, an adequate breakout of labor costs for any activity can be obtained by subtracting from the total activity value all the cost items which are not direct labor. These items are material and equipment costs, overhead, and profit. The remaining costs are production labor costs, including wages paid, fringe benefits, insurance and taxes, and overhead and profit markups. Through a process of elimination, a reasonably adequate determination of the manhours represented by the dollar amount of labor cost for an activity can be reached. The Government estimate for the project, the contractor's approved schedule of prices for payment, and data from the contractor's payroll submittals are also useful in projecting manpower levels on future activities.

c. That portion of the contract price devoted to labor costs indicates the contractor's anticipated level of labor productivity. Whether or not the anticipated profit can be realized from the completed project depends on the contractor's ability to maintain the planned labor productivity level. With expert management and some good luck, the contractor may achieve labor productivity exceeding original expectations.

d. The actual labor productivity of a project affects the cost of labor for modifications. On projects where actual labor productivity is running at or better than the contractor's anticipated level, data developed from the analysis described above is appropriate for prepricing ripple effect costs of modifications. However, when the contractor's actual labor costs are higher (productivity lower) than anticipated by the bid, actual experience data should be considered. Depending on the,degree to which contractor mismanagement has contributed to the higher labor costs, the estimator may find it expedient to use a combination of actual and anticipated productivity projections in arriving at a reasonable labor cost figure for the modification. This does not imply that a modification should be priced to reimburse the contractor for excess labor costs incurred because of inept management; however, it is possible to incur labor costs

higher than those anticipated. The higher costs could occur through no fault of the contractor. The estimator must take into account forward-pricing ripple effect, related to modification labor costs. And, even if the contractor is working inefficiently, and the Government causes that condition to occur longer because of the modification, GSA may be held responsible for such costs.

11. Productivity losses. Figs. 3-11.1 thru 3-11.8 illustrate the effects of various situations on construction manpower efficiency. The figures are included as a source of general information. Estimators may find them helpful in supplementing other data developed from modification cost estimates. However, the validity of the graphs has not been sufficiently tested to warrant their use in preference to established methodologies. While an efficiency factor may provide an important estimating technique, it should be based on a trade-by-trade analysis rather than on a general basis. Typical causes of loss in labor productivity on the unchanged work from modifications are as follows:

a. Disruption. The contractor's progress schedule represents the planned sequence of activities leading to final completion of the project. Workers who know what they are doing, what they will be doing next, and how their activities relate to the successful completion of the project develop a "job rhythm". Labor productivity is at its optimum when there is good job rhythm. When job rhythm is interrupted (i.e., when a contract modification necessitates a revision of the progress schedule), it affects workers on both the directly changed and/or unchanged work and may result in a loss of productivity.

(1) Disruption occurs when workers are prematurely moved from one assigned task to another. Regardless of the competency of the workers involved, some loss in productivity is inevitable during a period of orientation to a new assignment. This loss is repeated if workers are later returned to their original job assignment. Learning curves which graph the relationship between production rate and repeated performance of the same task have been developed for various industrial tasks. The basic principle of all learning curve studies is that efficiency increases as an individual or team repeats an operation over and over; assembly lines are demonstrations of this principle. Although construction work involves the repetition of similar or related tasks, these tasks are seldom identical. Skilled construction workers are trained to perform a wide variety of tasks related to their specific trade. Therefore, in construction it is more appropriate to consider the time required to become oriented to the task rather than acquiring the skill necessary to perform it. One of the attributes of the construction worker is the ability to perform the duties of his trade in a variety of environments. How long it will take the worker to adjust to a new task and environment depends on how closely related the task is to his experience or how typical it is to the work usually performed by his craft. Fig. 3-11.1 assumes that the worker will always be assigned to perform work within the scope of his trade, and that the average worker will require a maximum of one shift (8 hours) to reach full productivity. Full productivity (100 on the Theoretical Productivity Scale) represents optimum productivity for a given project. Fig. 3-11.2 is a tabulation of productivity losses derived from fig. 3-11.1.

(2) The time required for a worker (or crew) to reach full productivity in a new assignment is not constant. It will vary with skill, experience, and the difference between the old and new task. In using the chart or its tabulation, the estimator must decide what point on the theoretical productivity scale represents a composite of these factors. For example, an ironworker is moved from placing reinforcing bars to the structural steel erection crew. The ironworker is qualified by past training to work on structural steel, but the vast majority of his experience has been with rebars, and the two tasks are significantly different. In view of this, a starting point of "0" is appropriate. The estimator can determine from the chart that a "0" starting point indicates the ironworker will need 8 hours to reach full productivity, with a resulting productivity loss of 4 hours. The Government's liability is then 4 hours times the hourly rate times markups. As a second example assume the same ironworker is moved from

placing reinforcing bars for Building A to placing reinforcing bars for Building B. The buildings are similar but not identical. A starting point of "90" is appropriate. The duration of only 0.8 hours is required to reach full productivity, and the productivity loss is 0.4 hours. The Government's liability would then be 0.4 hours times the hourly rate times markups.

(3) The "average loss" (HR) shown in fig. 3-11.2,  for the construction industry is 50 percent of the "duration" (HR) column. For example: a worker operation at 70 percent of theoretical productivity scale on a new task will require 2.4 hours of labor at the task to reach 100 percent of theoretical productivity. During this 2.4 hour period he will produce 50 percent of the work a fully experienced worker will produce. In other words he will lose for his employer 1.2 work hours.

(4) The contractor normally absorbs many orientation/learning cycles as his labor forces are moved from task to task in the performance of the work. Only those additional manpower moves, caused solely by a contract modification, represent labor disruption costs for which the contractor is entitled extra payment.

b. Crowding. If a contractor's progress schedule is altered so that more activities must be accomplished concurrently, ripple effect costs caused by crowding can result. Crowding occurs when more workers are placed in a given area than can function effectively. Crowding causes lowered productivity; it can be a form of acceleration because it requires the contractor either to accomplish a fixed amount of work within a shorter time frame, or to accomplish more work within a fixed time frame. Granting additional time for completion of the project can eliminate crowding. When the final completion date cannot be slipped, increased stacking of activities must be analyzed and quantified.

(1) Activity stacking does not necessarily result in crowding. When concurrent activities are performed in areas where working room is sufficient, crowding is not a factor. But, if the modification forces the contractor to schedule more activities concurrently in a limited working space, crowding does result. Both increased activity stacking and limited (congested) working space must be present for crowding to become an item of ripple effect cost.

(2) Crowding can be determined using techniques similar to those used for acceleration. Fig. 3-11.3  illustrates the curves developed to represent increases in labor costs from crowding. Before applying this curve, the estimator must determine whether crowding will occur and to what degree. For example, the assumption that the contractor's scheduling of the activities in question is the most efficient sequencing of the work must be verified. Perhaps more workers can work effectively in the applicable work space than the contractor has scheduled; if they cannot, perhaps the crowding is not severe enough to justify using the full percentage of loss indicated by the graph. (The graph should be interpreted as representing the upper limit of productivity loss.) In this case, the estimator's judgment of the specific circumstances may indicate that some lower increase factor is appropriate.

(3) For example, assume that the estimator decides that severe crowding will occur in the following situation: The contractor's schedule indicates three activities concurrently in progress in a limited area of the project. Each of these activities employs five workers, placing a total of 15 workers in the area. One of these activities has a duration of 10 days; the other two have 20-day durations. The modification has required that a fourth activity be scheduled concurrently in the same limited area. This additional activity requires three workers; it has a normal duration of 5 days. There are now 18 workers in an area which can only efficiently accommodate 15. The percent of crowding is 3/15 or 20 percent. On the graph (see fig. 3-11.3 ), 20 percent of crowding intersects the curve opposite 8 percent loss efficiency. To find the duration of crowding, the estimator multiplies the normal duration of the added activity by 100 percent plus the percent loss of efficiency. For this example, 5 days times 1.08 equals 5.4 days. Therefore,

because of the inefficiency introduced by crowding, the added activity will require 5.4 days to complete. Likewise, on the three affected activities, the first 5 days of normal activity will now require 5.4 days. All four activities will experience loss of productivity resulting from an inefficiency factor equivalent to 0.4 of a single day's labor cost. This is calculated as follows:

Average hourly rate x hours worked per day x number of worker x 0.4 $ loss or $12.00 x 8 x 18 x 0.4 8691 plus normal labor markups.

3/18 x $691 = direct crowding cost; and should be included in the direct cost section of the modification estimate.

15/18 x $691 = crowding on unchanged activities, and should be listed as ripple effect on unchanged work on the modification estimate.

c. Acceleration. Acceleration may occur in a number of ways, but the two most common are: The Government requires completion in advance of the time specified in the contract; or the Government issues a modification requiring the contractor to complete more work during the same time period even though the contractor may be entitled to an extension of time to accomplish the changed work. This is sometimes referred to as "buying back time." Accelerated performance of the contract work could be done in any of the following ways:

(1) Increasing the size of crews. The optimum crew size (for any construction operation) is the minimum number of workers required to perform the task within the time frame allowed. Optimum crew size for a project or activity is a balance between an acceptable rate of progress and the maximum return from the labor dollars invested. Increasing crew size above optimum can usually produce a higher rate of progress, but at a higher unit cost. As more workers are added to the optimum crew, each new worker will increase crew productivity less than the previously added worker. Carried to the extreme, adding more workers will contribute nothing to overall crew productivity. Figs. 3-11.4 thru 3-11.7 indicate the effect of crew overloading. 

(2) Increasing shift length and/or days worked per week. The standard work week is 8 hours per day, 5 days per week (Monday through Friday). Working more hours per day or more days per week introduces premium pay rates and efficiency losses. Workers tend to pace themselves when working longer shifts and more days per week. An individual or a crew working 10 hours a day, 5 days a week, will not produce 25 percent more than they would working 8 hours a day, 5 days a week. Longer shifts produce some gain in production, but it will be a higher unit cost than normal hour work. When modifications make it necessary for the contractor to resort to overtime work, some of the labor costs produce no return because of inefficiency. Costs incurred due to loss of efficiency created by overtime work are a ripple effect because the increase in overtime results from the introduction of the modification. Contractors occasionally find that to attract sufficient manpower and skilled craftsmen to the job, it is necessary to offer overtime work as an incentive. When this is done, the cost must be borne by the contractor; however, if overtime is necessary to accomplish modification work, the Government must recognize its liability for introducing efficiency losses. Fig. 3-11.8  is the result of study which attempted to graphically demonstrate efficiency losses over a 4-week period for several combinations of work schedules. These data are included merely as information on trends rather than firm rules which might apply to any project. Although fig. 3-11.8 data does not extend beyond the fourth week, it is assumed that the curves would flatten to a constant efficiency level as each work schedule is continued for longer periods of time.

(3) Multiple shifts. The inefficiencies in labor productivity caused by overtime work can be avoided by working two or three 8-hour shifts per day. However, additional shifts introduce other costs. These costs would include additional administrative personnel, supervision, lighting, etc. Modifications that cause the contractor to implement shift work should price the ripple effect cost as appropriate for the activity being accelerated. Environmental conditions such as lighting and cold weather may also influence labor efficiency.

d. Morale. The responsibility for motivating the work force and providing environment conducive to optimum productivity rests with the contractor. Morale exerts an influence on productivity, but so many factors interact on morale that their individual effects cannot be calculated. Contract modifications, particularly a large number, have an adverse effect on the morale of workers. The degree to which this affects productivity, and consequently the cost of performing the work, would normally be very minor when compared to the other causes of productivity loss. It would probably cost more to document productivity losses from lowered morale than justified by the amount recoverable. Modification estimates do not consider morale as a factor because morale is determined by how effective the contractor's labor relations are.

12. Quantification. The following example demonstrates how to use figs. 3-11.4 thru 3-11.7 [] to quantify the ripple effect costs of crew overloading. Assume that the contractor has planned a construction operation with a duration of 15 working days and an optimum crew size of 10. The modification now requires that the contractor accomplish this operation in 10 working days.

a. The rate of production is defined as: The unit of work per amount of effort in mandays (MD):

The original rate of production is = 1 Job / 150 MD = .0067

The new rate of production is = 1 Job / 100 MD = .01

b. The percent increased in the crew's rate of production is defined by: The new rate minus the original rate divided by the original rate time 100. Thus,

(1 Job / 100 MD) - (I Job / 150 MD) x 100 - 01 - .0067 x 100 = 50%
(I Job i 150 MD) .0067

This represents a 50 percent increase in the crew's rate of production. From fig. 3-11.4  or 3-11.5,  it appears likely that a 50 percent production gain can be achieved by increasing the crew size 80 percent. Other options could be implemented to speed up production: the optimum crew could work longer shifts, more days per week; a second crew could be placed in operation (if allowed by the nature of the work). However, for this example, only increasing crew size is considered. The way to calculate the ripple effect cost before the fact is:

Original plan Acceleration Plan

Manpower 10 18
Hourly Rate $12 $12

Crew Cost/Day (8 Hours) $960 $1,728
Duration (Working Days) 15 10

Crew Cost (Cost/Day $14,400 $17,280
x Duration)

Taxes, Insurance $2,592 $3,110
Fringes (18 percent)

Total Crew Cost $16,992 $20,390

Ripple Effect Cost (Accelerated - Original) = $3,398 ($3,400)

- or -

Ripple Effect Cost (Accelerated Plan x Efficiency Loss) = $20,390 x 16.7 percent
(from fig. 3-11.7) = $3,405 ($3,400)

The amount of $3,400 would be placed in the modification estimate under "Ripple Effect on Unchanged Work" and identified by the activity involved. Increased cost of supervision, if necessary, is not included in this crew overloading analysis. Supervision must be costed separately, either as a separate item or as an element of Job Site Overhead, as appropriate.

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CHAPTER 4. TECHNICAL ANALYSIS

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1. Scope. This chapter provides guidance on when and how to perform a technical analysis of a contractor's proposal. Well-structured technical analysis of contractor proposals presenting information in an organized manner are a valuable tool for the support of contract negotiations. The technical analysis of the cost proposal is necessary: (a) to assist nontechnical personnel in evaluating the offeror's understanding of technical requirements and the quality of the work to be performed and (b) to assist the Contracting Officer in establishing a reasonableness of the contract modification price.

2. Definition. Technical analysis is an engineering and architectural evaluation of the functions that cause

costs to occur. The objective is to determine the necessity and reasonableness of these costs. Technical analysis requires the knowledge, experience and insight of engineers, architects, and estimators to compare and evaluate both the Government and contractor's cost estimates. The technical analysis of a contractor's proposal is the expression of a technical opinion regarding factors such as quantities (including waste, scrap and breakage), prices (material and labor), crew sizes, productivity, ripple effect, negotiation strategy, and equity.

3. Applicability. Technical analysis is an elective service that may be ordered at the discretion of the Contracting Officer. However, it should not be ordered unless it is cost beneficial to the Government, considering the cost to make the analysis, the magnitude of difference between the Government and contractor's estimates, and the potential savings in reducing the contractor's price request.

a. Guidance on ordering technical analysis service is as follows:

(1) Normally, it should not be ordered for modifications for less than $10,000 or where the difference between the Government estimate and contractor proposals is less than 10 percent.

(2) It should not be ordered on modifications that are presented as lump sum amounts in whole or major parts. A technical analysis can be performed only to the level of detail provided in the proposal received from the contractor.

b. Past practice. GSA estimates shall not be revised to match contractor proposals or settlements for the record, and proposals shall not be evaluated by making check estimates. Performance of a technical analysis explaining the differences between the estimate and a proposal is the proper procedure and is also more cost effective.

4. Performance of technical analysis. The technical analysis of the contractor's price proposal shall be performed by the GSA estimator who originated (or reviewed) the Government estimate. The estimator may call upon support from Office of Design and Construction (PC) technical personnel as required.

a. Level of detail; The effort expended in the technical analysis shall be commensurate with the potential value of items involved and the cost difference between the Government and contractor estimates. A technical analysis of an item costing less than $1,000 in value or where the cost difference between items is less than $1,000, is usually not cost effective.

b. Procedure. The estimator has responsibility for the accuracy, completeness,and logic of the technical analysis. In general, the following tasks are necessary to meet these responsibilities:

(1) The data must be prepared in a similar and parallel form, usually following the format submitted by the contractor. The preparation of technical analysis often involves converting elements of the Government estimate and may include:

(a) Rearranging or restructuring elements for clarity without changing the original estimated cost,

(b) Converting the units of measure to those used by the contractor,

(c) Regrouping various items of work in one estimate to compare with aggregates in the other,

(2) Comparing the two sets of data and determine the differences,

(3) Establishing a probable rationale for the differences if they are significant,

(4) Judging which set of data is "right." Stress why the Government's data is appropriate rather than emphasizing why the contractor's data is wrong, and

(5) Proposing negotiating objectives for the Government.

5. Technical analysis checklist. In reviewing the contractor's proposed price, the estimator should use the following checklist as a guide to identifying incongruities:

a. See that the work proposed covers minimum requirements and is responsive to the scope of work of the modification.

b. See that a sufficient quantity breakdown was provided as required by the contract and that all items were included in the proposal.

c. See that proposed delivery schedules conform with program need dates.

d. See how overall efforts/materials and task-by-task efforts/materials compare with the independent cost estimate.

e. See that items not required in the scope of the modification, or of marginal benefit to program needs.

f. Check capability and classification of personnel planned to be used on the job.

g. Evaluate for degree of technical similarity, i.e., complexity, size, etc., when the contractor uses prior experience as a basis of estimate.

h. Check need for labor loading and labor composition by task.

i. Check duplication of effort such as, the same work proposed under other tasks or other contracts.

j. Review the contractor's evaluation and use of subcontractor proposals.

k. Review proposed travel destinations, length of stay, number of persons per trip, per diem, allowances, use of rental cars, etc.

l. Check other direct charges by questioning need, quantity, adequacy, possibility of a less expensive substitute, etc.

6. Documenting the detailed comparison. Detailed comparison between Government and contractor estimates shall be made using the Technical Analysis Worksheet, GSA Form 3488. (See fig. 4-6 for a sample use of the worksheet.) A separate worksheet shall be used for each area of review. Normally, a minimum of three areas of review are required. These are comparison by:

a. Cost element such as labor hours, subcontractor contracts, labor skill or wage rates.

b. Task such as quantities of similar work items and types of work items.

c. Time such as by work item or milestone schedule.

7. Cost guidelines. In order to make a fully adequate comparison between the basis of the Government estimate and the estimator's interpretation of the contractor's proposal, the estimator should understand the following guidance for the components of cost normally included in each of these major categories:

a. Direct costs (FPR 1-15.202). A direct cost is any cost that can be identified specifically with a particular contract. Direct costs are not limited to items incorporated in the end services such as material or labor. Costs identified specifically with the contract are direct costs of the contract and are charged directly thereto. Costs identified specifically with other work of the contractor are direct costs of that work and are not to be charged to the Government contract directly or indirectly. When items ordinarily chargeable as indirect costs are charged to Government work as direct costs, the cost of like items applicable to other work of the contractor must be eliminated from indirect costs allocated to Government work. This definition shall be applied to all cost items of significant amount. Direct cost items of minor amount may be distributed as indirect costs provided in FPR 1-15.203 if the contractor can demonstrate that such treatment achieves substantially the same results. The following illustrate costs normally included in this category of costs:

(1) Direct salary costs normally include salaries for regular time and overtime (excluding overtime premium costs) of labor crafts. Where a principal participates directly in contract work in other than a management role, i.e., field supervision, the principal shall be paid at the rate of another qualified employee but not exceeding the principle salary rate. (FPR 1-15.403-7(c)(3)).

(2) Travel costs, including transportation, lodging, subsistence, and incidental expenses incurred by contractor personnel while in a travel status in connection with the performance of services required by the contract. FPR 1-15.205-46 generally requires the use of less than private aircraft. (FPR 1-15.403-4).

(3) Long distance telephone, telegraph, and cable expenses to be incurred in connection with the performance of work required in connection with the contract.

(4) Reproduction and/or printing costs including blueprints, black and white prints, ozalid prints, photographs, photostats, negatives, and express charges.

b. Indirect costs (FPR 1-15.203). An indirect cost (often referred to as overhead or general and administrative) is one which, because of its incurrence for common or joint objectives, is not readily subject to treatment as a direct cost. Minor direct cost items may be considered indirect costs for practical reasons, provided they are not also included as direct cost at the same time. After direct costs have been determined and charged directly to the contract or other work, indirect costs are those remaining to be allocated to the several classes of work. Since accounting practices vary, the use of particular groupings is not required. Neither is the use of any particular allocation base mandatory. However, it is mandatory that the method used results in an equitable allocation of indirect costs to the cost objectives which they support.

(1) Normally, the contractor's accounting system and estimating practices determines the method used to allocate overhead costs. The contractor's established practices, if in accord with generally accepted principles, provided they produce equitable results in the circumstances, will generally be accepted. Proposed overhead rates should represent the contractor's best estimate of the rates experienced during the contract period. They should be based upon recent experience and be adjusted for known factors

which will influence them.

(2) Common overhead groupings in contractor's firms are overhead for direct labor and general and administrative expenses. The first grouping usually includes employment taxes, fringe benefits, holidays, vacation, idle time, bonuses, etc., applicable to direct labor. The second generally includes the remaining costs which because of their incurrence for common or joint objectives are not readily subject to treatment as direct costs. It is expected, however, that proposed grouping will correspond with the contractor's normal method of accumulating indirect costs. No special categorization is required provided the results are realistic and equitable.

(3) Direct salaries are the base for overhead costs, but in some circumstances a direct labor hour base produces more equitable results. As in the cost of overhead cost groupings, the method to be used will depend upon the contractor's normal practices and the equity of the results produced in the circumstances.

(4) In the case of multi-branch firms, joint ventures or affiliates, expected overhead costs applicable to the specific location(s) where work is to be performed, will be proposed. Company-wide, joint venture or affiliate averages may not be appropriate. The rates should be tailored to the work locations. The objective is to allocate overhead costs more precisely.

c. Unallowable costs. The provisions of FPR Subparts 1-15.2 and 1-15.4 will be used in the evaluation and negotiation of proposed direct and indirect costs. Major unallowable costs discussed in the cited regulation are:

(1) Preparation and negotiation costs are not allowed for field inspection costs (FPR 1-15.403-5). Proposal costs for central or branch office design efforts are allowable as either a direct cost (FPR 1-15.202) or an indirect cost (FPR 1-15.203).

(2) Advertising costs, except for recruitment of personnel.

(3) Bad debts.

(4) Contributions and donations.

(5) Dividend provisions, payments, or distribution of profit.

(6) Entertainment costs.

(7) Fines and penalties.

(8) Idle facility costs generally.

(9) Costs of insurance on the lives of principals or employees when the firm is beneficiary.

(10) Interest and other financial costs.

(11) Losses on other contracts.

(12) Initial organization or reorganization costs.

(13) Federal income and excess profits taxes.

8. Judging cost. Elements for reasonableness and allocability is also an important estimator responsibility.

a. Reasonableness (FPR 1-15.201-3). A cost is reasonable if it does not exceed that which would be incurred by an ordinary prudent person in the conduct of competitive business considering that a given cost is:

(1) Ordinary and necessary;

(2) The results of sound and prudent business practices, competitive restraints, and arms length bargaining;

(3) In compliance with applicable laws, regulations, contract terms, and specifications; and

(4) Not overstated because of significant deviations from established estimating and accounting practices.

b. Allocability (FPR 1-15.201-4). A cost is allocable if it:

(1) Is incurred specifically for the contract modification;

(2) Benefits both the contract modification and other work and can be distributed to them in reasonable proportion to the benefits received; or

(3) Is necessary to the overall operation of the business although a direct relationship to any particular cost objective cannot be shown.

9. Technical analysis report. The performance of technical analysis must conclude with the submission of a formal report to the Contracting Officer. The report should contain what was analyzed, how it was analyzed, assumptions made, and recommendations in sufficient detail that the report will be a complete document. Opinions or conclusions voiced in the report without good explanation are of little use to the Contracting Officer. The report will primarily consist of:

a. A summary memorandum which transmits the development of rationale, costs and ripple effects for a recommended negotiation objective and final settlement position.

b. Detail supporting data consisting of the Technical Analysis Worksheets (GSA Form 3488) prepared to compare the two estimates.

10. Negotiation of final settlement. The Government estimator should be present and participate in the negotiation of the final settlement. At the discretion of the Contracting Officer, the estimator may lead the Government negotiation.

a. During negotiation, GSA approaches the contractor with a figure it believes to be reasonable, and the contractor approaches with a figure he believes is sufficient to protect him. Reaching an equitable agreement under these circumstances is difficult and time consuming.

b. However, in cases where it is essential that the contractor be allowed to proceed on modification work

before the price/time terms are settled must be kept to an absolute minimum. The attitude that the urgency for reaching a settlement no longer exists once the order to proceed has been issued is self-defeating. Some of the reasons why it is advantageous to the contractor to delay final settlement of all modifications until the work is finished are as follows:

(1) The contractor can be less cost conscious in doing the work.

(2) Some of the risks assigned to the contractor are shifted to the Government.

(3) The contractor will have actual cost data with which to confront the Government. (Actual cost under this circumstance does not necessarily represent reasonable cost.)

c. The GSA goal, on the other hand, is to reach final agreement on contract modifications before the work is 50% complete (at a maximum) so that:

(1) The contractor has more incentive to accomplish the work in the most efficient manner.

(2) The cost risks stay with the contractor.

(3) The burden of proving that the price is reasonable remains with the contractor.

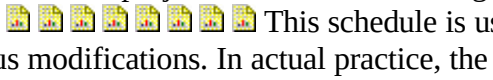
(4) Final agreement on the cost of the work is not reached on a cost-plus-a-percentage-of-cost basis.

(5) The proper financial management of the contract is made easier.

d. A major benefit of settling modifications before the work is performed is that it encourages prompt revision of the progress schedule, thus maintaining accurate knowledge of the sequencing of the remaining work, the final contract price, and the final completion date. The schedule then remains a realistic tool for determining the impact of future changes on the contractor's operations.

11. Settlement of the modification. On the document used to execute a contract modification (GSA Form 1137), the settlement terms should show ripple effect costs on the unchanged work as a defined element or a statement that it has been considered, even if only a lump sum amount (including zero dollars) is shown. This should be in addition to identification of the allowance for cost on the changed work. Such information on the official modification document makes it apparent to everyone that the contractor has been compensated for ripple effect costs, and has agreed that the amounts shown are reasonable and acceptable, and can deter the contractor from later claiming additional compensation for the modification because the settlement omitted ripple effect costs. (In a case where there is no ripple effect on the unchanged work is involved, "0" or "none" should be noted for the ripple effect costs.)

Appendix A. Examples

To demonstrate procedures described in ch. 3-4, a NAS progress schedule has been prepared for a hypothetical construction project. The contractor's original schedule, approved by GSA, is shown in figs. A-2a thru A-2h.  This schedule is used as the basis for analyzing the ripple effect caused by various modifications. In actual practice, the original schedule would be revised after each modification, and the new schedule would become the basis upon which the next modification would be evaluated; however, to avoid complicating the examples shown here, each situation will be dealt with as though the original schedule was valid when the modification occurred.

a. Example 1.

(1) Assume that it is necessary to modify the contract to correct a dimension controlling the building location. The contractor had just completed Activity 201-203, Layout, when the error in the plans was detected. Almost all of the critical Activity 201-203 must now be redone.

(2) The estimator begins the analysis by marking up the network (fig. A-2a) to indicate actual job status (fig. A-3). The figure shows Activities 1-201, 1-207, and 201-203 completed, and Activity 201-207, 50 percent complete. The modification directly changes the work and duration of critical path Activity 201-203 only. Critical path Activity 203-207, Excavation 1/2, depends on the completion of Activity 201-203 for its start. Likewise, the start dates for all subsequent critical path activities will be delayed for the length of time determined reasonable to complete Activity 201-203. Looking further at the schedule, it can be determined that increasing the duration of Activity 201-203 will not effect the completion of Activity 201-207; and Activity 205-225 has sufficient float to absorb the delay to its early start date.

(3) A review of the status of materials submittals and deliveries indicates that they are proceeding essentially on schedule, so materials do not effect the remaining work, nor become a cost factor for this modification.

(4) onsite manpower is not significant in this case, except for Activity 201-203. The crew assigned to this activity will be the basis for determining the direct labor costs applicable to this modification.

(5) Except for some powered hand tools used on Activity 201-207, the only equipment on site is a contractor-owned backhoe used in excavation work for Activity 203-207. Since the modification has delayed the completion of Activity 201-203, the date the backhoe can be placed in service is also delayed. This is a ripple effect, included in the ripple effect portion of the estimate.

(6) Activity 201-203, as modified, can best be accomplished using the existing crew assigned to that work; and the additional work will require 5 calendar days to complete. Therefore, the schedule is modified to indicate a new duration of 13 calendar days (8 plus 5) for Activity 201-203 (fig. A-3). This actually causes the time frame of all remaining critical activities to slip 5 calendar days; but for this example, it is not considered necessary to provide a printout showing this result.

(7) A review of the remaining work--which in this case amounts to nearly the entire project--indicates that a slippage of 5 calendar days does not impact on the unchanged activities that would require further rescheduling. The slippage in the final completion date is acceptable to the Using Agency. Consequently, the revised schedule developed by the estimator to analyze the effects of the modification shows only two pertinent factors; i.e., Activity 201-203 will incur the direct costs of the modification and have its duration increased 5 calendar days, and Activity 203-207 will sustain ripple effect costs for equipment standby time. The estimate will be prepared accordingly.

b. Example 2. For this example, the effects of Example 1 on the progress schedule will be disregarded. The original schedule will be considered applicable.

(1) Assume that on September 15, 1978, a GSA Form 1137, is sent to the contractor requesting a proposal for a change order which proposes the following:

(a) Increasing the size of exterior doors.

(b) Reducing the air-to-air roof U-Value from 0.07 to 0.05.

(c) Adding 50 lineal feet of 4" thick 4-ft-wide and 3,000 psi concrete sidewalks.

(2) The first step toward identifying ripple effect and preparing the estimate is to mark up the progress chart to show actual progress to date. (See figs. A-4a thru A-4d. ) The project is on schedule with Activity 223-227, Backfill Foundation Walls, 50 percent complete; and Activity 205-225, Under-ground Water and Sewer Lines, 60 percent complete. Procurement activities are also proceeding according to plan, with no delays foreseen.

(3) From the NAS it can be seen that the modification will directly affect Activity 231-235, Door Frames, Windows, and Louvers, and Activity 243-245, Roofing and Sheet Metal (roof insulation is included in this activity). Since there is no existing activity for sidewalks, a new activity will need to be created to include this work.

(4) The schedule mark-up reflects the effects of this modification, and begins with the first activity to be changed; i.e., Activity 231-235. As fig. A-4d indicates  , the doors and frames are now on the job site, but because of this modification they are unusable. Activity 231-235 has 14 days of float indicated (see fig. A-2h ); however, this does not apply to the door frame. The door frames must be available very shortly after the start of critical Activity 227-235, Exterior Masonry, to avoid delaying that activity. The contractor is consulted to establish the quickest way to obtain new door frames, and the following factors are identified: the door size now specified is not standard with the manufacturer who supplied the doors onsite, the best date received from other manufacturers in 45 days after receipt of an order, the manufacturer of the doors and frames on-site will rework the doors and frames to meet the new size requirement, at a cost of $50 per frame and $100 per door; and reworking the frames at the manufacturer's plant will require 5 work days after receipt. Reworking the doors will require 20 work days after receipt. (The cost of shipment will be borne by the contractor.) The Regional Design and Construction Office (which requested the change) is contacted and it is confirmed that the modification is mandatory. The contractor proceeds to deliver the doors and frames to the manufacturer in his own truck. The contractor will also use his own truck to pick up the reworked materials when ready, since this is considered faster and less expensive than using commercial carriers. The estimator decides that 2 work days will be required to deliver the frames and doors, 5-work days to remanufacture the frames, 2 work days to return the frames to the site, 13 work days more to rework the doors, and 2 work days to return the doors to the site. It is concluded that only the frames are critical, so the 9 work days required to obtain them is considered first. Converting from work days to calendar days produces a 13-calendar day delay in receipt of the new door frames. Rather than change the duration of Activity 73-105, Doors and Windows (procurement), which is complete and carries no monetary value, a new Activity 105-106, Rework Frames (Mod 2), is created and assigned a duration of 13-calendar days (see fig. A-4b ). The activity has a start date of September 16, 1978; and a finish date of September 28, 1978. Since Activity 105-106 constrains the start of Activity 231-235, the early start of Activity 231-235 is adjusted to September 29, 1978. (The original early start date for Activity 231-235 was September 18, 1978, and the late start date was October 2, 1978. It now appears that Activity 231-235 has plenty of float to absorb the delay caused by its early start date without affecting Critical Activity 227-235. But the float in Activity 231-235 is misleading. The door frames must be available within a short time following the start of the masonry work. The estimator now faced two choices on how to schedule Activity 227-235, Exterior Masonry:

(a) Option A. Allow the exterior masonry work to start as scheduled on September 17, 1978, and let it proceed as far as it can (estimated 4 calendar days) before door frames are needed, then shut down and wait for door frames (September 29, 1978). Following delivery of door frames, resume operations and complete the activity.

(b) Option B. Delay the start of the exterior masonry work until such time that once started it can proceed to completion without interruption. This adjusts the date for Activity 227-235 to September 25, 1978, or 4 calendar days before the door fames are due at the site.

(5) Both Options A and B will cause work on the critical path to slip the same amount--8-calendar days; i.e., September 29 minus September 17, 1978, plus 4 calendar days. Although both options must address any ripple effect costs arising from the 8-day delay, only Option A introduces the additional impact liabilities associated with disruption of the masonry work after it is underway. Therefore, Option B is selected, since it represents the least effect on the contractor's operations.

(6) The estimator must remember to include the time (and later the cost) for reworking the doors on the schedule. Since the installation of exterior doors does not really represent a constraint on masonry work completion or any other activity scheduled in the near future, reworking the doors is an extension of procurement Activity 73-105. However, this does not coincide with new Activity 105-106; another new activity must be created. If node 105 is used as the starting point and node 235 is used as the finishing point, a new activity 105-235, Rework Doors (Mod 2), is created (see fig. A-4b ). This activity has an early start date of September 16, 1978, and a duration of 34-calendar days. Its early finish will be October 19, 1978, and its late finish is October 24, 1978, (coinciding with the finish date of critical Activity 227-235). Activity 105-235 has been placed between nodes 105 and 235 for convenience, and to locate it in a realistic time frame.

(7) The result of the foregoing analysis and revision to the progress schedule caused by the first part of the modification is as follows:

(a) New Activity 105-106, Rework Door Frames (Mod 2), was created (see fig. A-4b ). It has an early start of September 16, 1978, and a duration of 13 calendar days. Its completion is prerequisite to the start of Activity 231-235.

(b) Existing Activity 231-235's early start date has been slipped to September 18, 1978. Its duration remains unchanged, because the time and effort required to install the revised frames and doors is not much different from that required for the originally specified materials.

(c) Existing critical path Activity 227-235's start date has been slipped 8-calendar days to September 25, 1978. Its duration remains unchanged.

(d) New Activity 105-235, Rework Doors,(Mod 2), was created to show the time frame for this noncritical activity. It has an early start of September 16, 1978, a 34-calendar day duration, and 5 days of float.

(e) Since a delay of 8-calendar days has been placed in the critical path at Activity 227-235, all subsequent activities will also slip 8-calendar days. In actual practice, a new mathematical analysis would report revised sets of dates for the remaining activities, including a new final completion date. Since the only purpose of this example is to demonstrate ripple effect, a revised mathematical analysis is not included.

(8) The second part of the modification requires a change in the roof insulation. The current job status of Activities 1-13, 13-45, 45-77, and 77-109 shows that the material has been submitted, approved and ordered (see fig. A-4d). However, as of September 16, 1978, the material has not been delivered to the site, although it is scheduled to arrive not later than October 29, 1978. The October deadline is necessary because the second part of the modification constrains the start date of critical Activity 243-245. This activity contains the installation of roof insulation, and is scheduled to start on October 30, 1978 (see fig. A-4c). In view of the 8-calendar day slippage in the schedule caused by the first part of the modification, the revised start date for critical Activity 243-245 is November 7, 1978. Consequently, the late finish date for Activity 77-109 is November 6, 1978.

(9) The estimator collected the following information:

(a) The roof insulation, roof membrane materials, and roof sheet metal items included in Activity 77-109 (see fig. A-4d) are to be provided and installed by a subcontractor.

(b) The modification does not affect roof membrane materials.

(c) The originally specified roof insulation is promised for delivery at the job site on or before October 15, 1978. The subcontractor plans to achieve the modified U-value by placing another layer of the same brand of insulation on top of the original.

(d) The insulation manufacturer will not guarantee a delivery date or price for the required additional material until a purchase order is received

(e) The prime contractor's purchasing agent has contacted all known insulation distributors, and found that none of them have the required types and thickness of insulation in stock. These manufacturers are filling orders as fast as they can, but the average wait is 60 days.

(f) The subcontractor has received the necessary sheet metal stock and is fabricating gutters and fascia in accordance with approved shop drawings. The fascia detail, however, will require revision because the modification has increased the insulation thickness.

(10) In view of the above, the Construction Engineer (CE) who is also the Contracting Officer Representative takes the following actions:

(a) The contractor is informed that resubmittal of U-value calculations will not be required, because the original submittal provides sufficient data to indicate that the proposed additional thickness will produce the required 0.05 U-value.

(b) A voluntary commitment is obtained from the contractor to stop fabricating sheet metal fascia and to resubmit revised shop drawings.

(c) The CE will contact the insulation manufacturer to obtain the best possible deliver date for the contractor; emphasis will be put on the urgent need for delivery of the material no later than November 6, 1978, if job progress is to be maintained.

(11) Information is obtained from the CE and the contractor, indicating that the insulation manufacturer promises delivery of the additional materials on or before November 1, 1978 at $0.35/sq ft, FOB job site.

(12) The estimator returns to the progress schedule and creates as an Activity 78-109, Procure Additional Roof Insulation (Mod 2), with an early start date of September 17, 1978, and a duration of 46 calendar days (see fig. A-4b ). The late finish date of this activity will be November 6, 1978, to provide 5 calendar days of float. New Activity 80-109, Fascia Rework (Mod 2), is also created. Activity 80-109 has an early start date of September 17, 1978, a duration of 30-calendar days (which includes resubmittal and approval of revised shop drawings, and refabrication of fasica), a late finish date of November 6, 1978, which provides 21 calendar days of float (see fig. A-4b ). By placing the modified work in the two new activities, the NAS now shows that the start of critical Activity 243-245 will not be delayed beyond November 7, 1978 (the date it was slipped to by the first part of the modification).

(13) When the first part of the modification was inserted into the progress schedule, Activity 243-245 was an affected unchanged activity -- its time frame slipped 8-calendar days. The second part of the modification directly affects Activity 243-245, since another layer of insulation, deeper plates, and revised fascia must be added. The estimator must now evaluate the combined effect to the first and second part of the modification on critical Activity 243-245.

(a) The activity is now scheduled for a time period later than the contractor originally planned; i.e., November 7 through November 17, 1978, instead of October 30 through November 9, 1978. The estimator must decide whether or not this will cause the contractor's cost and/or time required to accomplish the work to increase. Weather is the primary factor in this case. In many parts of the country, the approach of winter reduces the number of days suitable for roofing operations. It is likely--but not certain--that more days unsuitable for roofing will occur during the period November 7 through November 17, 1978, than October 30 through November 9, 1978. Probabilities developed using historical weather data are specific enough for this situation.

(b) The work in Activity 243-245 has been increased since the contractor must now place an additional layer of insulation, and build up the nailers and plates. The time and cost of reworking the sheet metal fascia is covered in Activity 80-109; its installation, covered in Activity 243-245, requires no time or cost adjustment. One additional day is considered reasonable by the estimator for doing the revised insulation and associated work. The duration of Activity 243-245 is increased to 12 calendar days, extending the finish date of the activity to November 18, 1978. This extension causes an equal slippage in all subsequent activities. As the estimate develops, appropriate monetary values for Activities 78-109, 80-109, and 243-245 will be established.

(14) The third part of the modification described in this example 2, adds some sidewalk work. There was no sidewalk in the contract before; consequently, there is no applicable existing activity in the network. The estimator must now study the progress schedule and determine where this new work will best fit. The following are pertinent considerations:

(a) The time required to grade, form and place the sidewalk is 3 calendar days.

(b) The sidewalk work must be completed before inclement weather arrives.

(c) Underground Utilities, Activity 205-225, should be in and backfilled in the sidewalk area before sidewalk construction starts.

(d) Fine Grading the Site, Activity 247-253, should (preferably) be completed after the sidewalks are constructed.

(e) Exterior Masonry; Activity 227-235, will probably obstruct at least part of the sidewalk construction area. So Activity 227-235 should be finished before starting sidewalks.

(15) Based on the above analysis, the estimator decides that creating new Activity 235-247, Sidewalks (Mod 2), is appropriate. The new activity has a duration of 3-calendar days with an early start date of October 25, 1978, late finish date of November 17, 1978, and 21-calendar days of float (see figs. A-3 thru A-4b ). New Activity 235-247, Sidewalks (Mod 2), (see fig. A-4c ), permits the contractor to perform the work any time between October 25 and November 17, 1978, without causing any ripple effect on the unchanged work.

c. Example 3.

(1) The original approved progress schedule, (see fig. A-2a thru A-2h ), is used as the basis for analyzing effects of this example. Note that in actual practice, a schedule revised to reflect previous modifications would account for the cumulative effect of multiple modifications.

(2) For this example, assume that:

(a) The contract calls for the contractor to construct an area of thickened floor slab within the building, and to install Government-furnished anchor bolts in a pattern to be determined by a Government-furnished template.

(b) The contract further stipulates that the anchor bolts and template (GFE) will be furnished to the contractor within 90 days after notice to proceed on the contract (in this case, by September 22, 1978).

(c) The contractor's approved progress schedule indicates that possession of the GFE is prerequisite to the start of Activity 239-245, Floor Slab Subgrade (see fig. A-2c ). The early start date for Activity 239-245 is October 28, 1978, well beyond the date scheduled for delivery of the bolts and template. Although the contractor does not really require the GFE to begin subgrade preparation, it is necessary for the completion of that activity. GFE is prerequisite to starting Activity 251-255, Floor Slab Concrete. (See fig. A-2d ).

(d) The CE requested confirmation from the Using Agency, of the GFE delivery date and, on October 2, 1978, is advised that there will be some delay in obtaining the GFE because of equipment revisions that required changes to the anchor bolt sizes and configuration. Therefore, even though every effort is being made to obtain the revised bolts and template, there will be a minimum delay of 30 days.

(e) The CE advised the contractor of the anticipated delay, and discussed the possibility of blocking out the anchor bolt area so the remainder of the floor slab could proceed uninterrupted.

(f) On November 1, 1978, the contractor advised the CE by letter that the Government's failure to furnish the GFE as stipulated in the contract would generate additional costs and that if the GFE were not received by November 15, 1978, he would be required to shut down the job. The letter further advised that the contractor would submit a claim for all additional costs and delays after the GFE arrives and the actual costs/delays can be calculated.

(g) The claim letter is forwarded to the Contracting Officer (CO) with the CE's comments verifying the claim's validity. The CO indicates that the Using Agency expects to ship the GFE on November 15, 1978,

directly to the CE. The Using Agency has indicated that a slippage in the final completion date is not acceptable. They also object to blocking out the anchor bolt area for placing the bolts later.

(h) On November 17, 1978, the contractor is finishing Activity 249-251, Floor Concrete-1st 1/2, and advises the CE that he will shut down the job the next day unless directed differently. Although the contractor does not normally work on weekends (November 18 and 19, 1978, are Saturday and Sunday), he correctly points out that his schedule calls for critical Activity 251-255, Floor Concrete-2nd 1/2, to be accomplished on those days, so they have been added to the work schedule. It is confirmed that the GFE was shipped on November 15, 1978, but its exact whereabouts is unknown.

(i) The CE agrees that working on the weekend would be unproductive under the circumstances, but indicates to the contractor that since no stop order has been issued, the contractor is expected to staff the job on Monday, November 20, 1978. No work was performed on November 18 and 19, 1978, The CE kept the office open on Saturday, but the GFE did not arrive.

(j) On Monday, November 20, 1978, the contractor had workers on the job, but there was little to be done and the contractor reminded the CE that the Government is responsible for paying his costs. At 11:00 a.m., the GFE arrived and was immediately turned over to the contractor. That afternoon the bolts were set to template and made ready for concrete. On November 21 and 22, 1978, the concrete was placed, finished, and placed under cure. Critical Activity 251-255 was completed on November 22, 1978, 3 days later than schedule.

(k) While the estimator was developing cost/time data to represent the Government's liability in this case, the CE was looking for a means to get the work back on schedule. After the first half of the floor slab had been curing for 5 days, the CE authorized the contractor to begin stockpiling masonry materials on it and to remove the curing from the second half slab concrete on November 28, 1978. These actions shortened the duration of critical Activity 255-259, Cure Floor Slab, enough to permit the critical interior masonry work, Activity 259-267, to start when originally scheduled (November 29, 1978).

(3) The following conclusions were reached by the estimator in the case described above:

(a) The contractor incurred no additional cost; in fact the premium labor costs (which would have occurred if the weekend had remained on the work schedule) were saved.

(b) No time was lost on the critical path, because the delay in completing the second half slab was immediately offset by shortening the subsequent curing period. And since the required curing period was less than the duration assigned to the activity by the contractor, the CE did not waive any contract requirement.

(4) The contractor's claim, which arrived at the CE's office on December 1, 1978, asked for an increase in contract price equaling the cost of the entire onsite crew for 4 hours, plus half the crew for 4 hours on November 20, 1978. In addition, the contractor claimed a 3-day time extension, the cost of 3 days' temporary heating, and markup because the start of Activity 251-255 was delayed from November 18 to November 21, 1978.

(5) On December 4, 1978, the CE and contractor met to discuss the claim. The CE explained that while the late delivery of the CFE was acknowledged, the real issue was whether the delay increased the contractor's cost of performing the work and/or whether it constrained the completion of any phase of the work to the extent that final completion of the project was affected. The estimator's conclusions as

outlined in paragraph c(3) above were also explained to the contractor by the CE; with respect to the contractor's claim for additional temporary heating. The CE reminded the contractor of his commitment to provide temporary heating continuously after the subgrade was prepared. Therefore, it seemed that charges for additional heating costs were not justified. The contractor made a token protest, but had no real argument with the decision. The contractor finally agreed to drop the claim and indicated that a letter would be sent to the CE rescinding the November 1 and December 1, 1978, claim letters.

(6) This is a case where the Government was at fault and the contractor protected his rights by promptly notifying the CE of an intent to claim. However, circumstances developed wherein the CE was able to almost totally mitigate the effect on the contractor. A "No Change in Price or Time" modification was issued to provide written evidence of the specifications change and to protect the Government.

(7) The example points out an important element of contract administration; i.e., that it is the duty of the CE (and staff) to use every available means to reduce the cost of each claim and modification. By no means should this be construed to suggest it is good practice to attempt forcing the contractor into unreasonable settlements. The principle of "equity" is as severely violated by settlements that are too low as it is by ones too high. The interests of the Government and the contractor are best fulfilled when there exists a working relationship based upon mutual respect and trust. It is the CE's responsibility to initiate such a relationship, and demonstrate the Government's desire for fairness in the way controversial issues are handled. Before-the-fact estimating of the effect a modification will have on the contractor requires indepth knowledge of the contractor's operations. Keeping the cost of a modification to the minimum requires planning the additional work so it causes the least possible disruption to the contractor's work flow. Factual input from the contractor can be of great help to the Government personnel involved. However, when negotiating time and cost modifications, the contractor is likely to be more pessimistic than the Government construction personnel. Creating an environment where the exchange of information is routinely accomplished in the planning, payment, and execution of modifications serves the interests of all parties involved.

Validation

Status: Final